CLAIMS

1. A phase mask, for forming a diffraction grating in an object for an optical medium, including a photosensitive part by exposing the object to UV light containing diffracted light rays to cause the refractive index of the photosensitive part of the object to change by interference fringes produced by interference of diffracted light rays of different orders of diffraction, said phase mask comprising:

a transparent substrate having one surface provided with a pattern of a plurality of grooves;

wherein the pattern of the grooves has a duty ratio adjusted according to the positions of the grooves so that apodization exposure can be achieved when the object is exposed to the UV light through the phase mask.

2. The phase mask, for forming a diffraction grating, according to claim 1, wherein

the duty ratio of the pattern is adjusted by adjusting the respective widths of the grooves for apodization exposure according to the positions of the grooves.

3. A phase mask, for forming a diffraction grating in an object for an optical medium, including a photosensitive part by exposing the object to UV light containing diffracted light rays to cause the refractive index of the photosensitive part of the object to change by interference fringes produced by interference of diffracted light rays of different orders of diffraction, said phase mask comprising:

a transparent substrate having one surface provided with a pattern of a plurality of grooves;

wherein the respective depths of the grooves are adjusted according to the positions of the grooves so that apodization exposure can be achieved when the object is exposed to the UV light through the phase mask.

4. The phase mask, for forming a diffraction

grating, according to claim 1 or 3, wherein

the phase mask is characterized in forming a diffraction grating in the object having a discontinuously changing period.

5. The phase mask, for forming a diffraction grating, according to claim 1 or 3, wherein

the object is used for forming an optical waveguide.

6. The phase mask, for forming a diffraction grating, according to claim 5, wherein

the object is used for forming an optical fiber.

7. A phase mask fabricating method of fabricating a phase mask, for forming a diffraction grating in an object for an optical medium, including a photosensitive part by exposing the object to UV light containing diffracted light rays to cause the refractive index of the photosensitive part of the object to change by interference fringes produced by interference of diffracted light rays of different orders of diffraction, comprising a transparent substrate having one surface provided with a pattern of a plurality of grooves, said phase mask fabricating method comprising the steps of:

preparing a transparent substrate; and

processing the transparent substrate by a photolithographic process including an exposure step for forming grooves, a pattern development step and an etching step;

wherein exposure for forming the grooves is changed during the photolithographic process such that the pattern of the grooves has a duty ratio adjusted according to the positions of the grooves so that apodization exposure can be achieved when the object is exposed to UV light through the phase mask.

8. The phase mask fabricating method according to claim 7, wherein

the photolithographic process adjusts the exposure by a multiple exposure method in forming the grooves.

9. A phase mask fabricating method of fabricating a phase mask, for forming a diffraction grating in an object for an optical medium, including a photosensitive part by exposing the object to UV light containing diffracted light rays to cause the refractive index of the photosensitive part of the object to change by interference fringes produced by interference of diffracted light rays of different orders of diffraction, comprising a transparent substrate having one surface provided with a pattern of a plurality of grooves, said phase mask fabricating method comprising the steps of:

preparing a transparent substrate; and

processing the transparent substrate by a photolithographic process including an exposure step for forming grooves, a pattern development step and an etching step;

wherein the number of times of the photolithographic process in order to adjust the respective depths of the grooves according to the positions of the grooves so that apodization exposure can be achieved when the object is exposed to the UV light through the phase mask.

10. The phase mask fabricating method according to claim 7 or 9, wherein

the exposure step in the photolithographic process is carried out by an electron lithography system or a laser lithography system.

11. The phase mask fabricating method according to claim 7 or 9, wherein

the object is used for forming an optical guide.

12. The phase mask fabricating method according to claim 11, wherein

the object is used for forming an optical fiber.

13. A diffraction grating forming method using a phase mask comprising a transparent substrate having one surface provided with a pattern of a plurality of

grooves having a duty ratio adjusted according to the positions of the grooves so that apodization exposure can be achieved when an object for an optical medium, having a photosensitive part is exposed to UV light through the phase mask, said diffraction grating forming method comprising the steps of:

exposing the object to UV light containing diffracted light rays diffracted by the phase mask; and

forming a diffraction grating in the object by causing the refractive index of the photosensitive part of the object to change by interference fringes produced by interference of the diffracted light rays of different orders of diffraction.

14. A diffraction grating forming method using a phase mask having a transparent substrate having one surface provided with a pattern of a plurality of grooves respectively having depths adjusted according to the positions of the grooves so that apodization exposure can be achieved when an object for an optical medium, having a photosensitive part is exposed to the UV light through the phase mask, said diffraction grating forming method comprising the steps of:

exposing the object to UV light containing diffracted light rays diffracted by the phase mask; and

forming a diffraction grating in the object by causing the refractive index of the photosensitive part of the object to change by interference fringes produced by interference of the diffracted light rays of different orders of diffraction.